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A Study of Elevator Braille Signage System in Ho Chi Minh City, Vietnam

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Abstract

Elevator equipment for Ho Chi Minh City, Vietnam building internal investigation, the Braille system of barrier-free lift equipment set up, and analysis of the situation of the different differences; research project based on accessibility norms as explore, and research purposes: First, Ho Chi Minh City Elevator Braille system analysis and explain the meaning of its contents. Second, according to the Vietnamese construction standards TCXDVN264: 2002 current building barrier-free facilities standards, finding Braille panel 85.7% used English Braille, and 14.3% used Korean Braille. Elevator equipment shall comply with the provisions of the concept of universal design.

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Keywords: Ho Chi Minh city; braille signage system; universal design

1. Introduction

The subject of this study is accessible elevator Braille systems in Ho Chi Minh City, Vietnam. The research background and motivation and objectives of this study have elaborated as follows:

1.1. Background and motivation

This study investigates main limit accessible elevators the Braille system, the literal meanings of Braille

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symbols, locations, keyboard layout, and floor setups in elevators in Public Transport (Syazwani et al.,2012) department stores, office buildings, and hospitals in Ho Chi Minh City. About Literature Review reference Vietnamese Construction Standards TCXDVN 264:2002 and buildings (Syazwani et al.,2012) . It compares elevator specifications from four aspects, namely, design, use, construction, and cultural psychology, with details provided below:

1.1.1. Design aspect

According to section 5.8.3 of the Vietnamese Construction Standards TCXDVN 264:2002 specifications, Braille systems must be provided in accessible elevators in public buildings, venues, and public transport systems to accommodate the use by the disabled as shown in Fig.1.

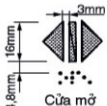





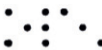
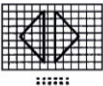







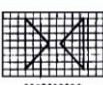



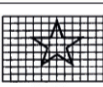



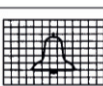



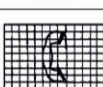



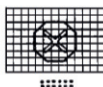
Nút điều khiển	Ký hiệu quy ước	Ký hiệu theo thứ tự chữ nổi braille	Tỷ lệ
 Cửa mở			
 Cửa mở nhìn từ phía trong			
 Cửa đóng			
 Cửa đóng nhìn từ phía trong			
 Ký hiệu tại lối vào chính			
 Điện thoại			
 Điện thoại			
 Dừng lại			

Fig.1. Vietnamese construction standards TCXDVN 264:2002 specifications

1.1.2. Use aspect

During research to examine the accuracy of Braille symbol placement in elevators, field studies had conducted and photos had taken. Braille chips have typically placed in two locations: (1) at the lower part of control buttons, and (2) at the right side of control buttons. Vietnamese legislation regulates that Braille

symbols must be placed "at the lower part of control buttons." Consequently, the cases collected from the field studies had compared against current regulations in Vietnam for an accuracy analysis.

1.1.3. Construction aspect

Braille systems in elevator facilities in public buildings have adopted as an integral design of elevator control buttons which in Ho Chi Minh City, Because construction workers may not have sufficient knowledge of Braille symbols, they may not accurately place symbols, leading to incorrectly arranged or reversely positioned Braille symbols. This study examines the accuracy of the content, implementation, placement, and proportioning of these Braille systems.

1.1.4. Cultural and psychological aspect: (Mao-pin Su 2010)

There are more than 1 million ethnic Chinese residents in Vietnam, chiefly concentrated near Ho Chi Minh City and the vicinity of the Mekong Delta, with over 500 thousand living in Ho Chi Minh City alone. Facilities in various localities have undergone changes to adapt to local culture and customs . Hospital buildings have closely related to matters of life and death, where the number 4 has particularly avoided as taboo in traditional Chinese culture. (Liang Tseng et al.,2013)

1.2. Research objectives

The primary purpose of this study was to conduct a survey on the current situation of elevator Braille systems in hospitals, office buildings, and department stores near Ho Chi Minh City. The refinement of elevator Braille systems that better suit elevator deployment scenarios have subsequently proposed based on the survey results areas as follows: (1) Braille systems in elevator facilities; (2) functional meanings and the positioning of control buttons; (3) Braille systems in use; and (4) the button layouts for the control panels of accessible elevators (Liang Tseng et al., 2012) It has expected that the findings of this study can be used as a reference for accessible elevator Braille chip system design and construction in Taiwan, as well as a reference for a universal design (UD) ^(*) complying with international standards.

2. Research subject and procedure

The subjects of this study include hospitals, office buildings, and department stores in Ho Chi Minh City, Vietnam. The details have reported below after synthesizing and analyzing the current situation of accessible elevator facilities, This study targeted seven buildings in Ho Chi Minh City, Vietnam, including one hospital, three department stores, and three office buildings. Representations of these buildings have shown in Table 1.

Table 1. Ho Chi Minh City, Vietnam to investigate the object

Code	H.hcm 01	O.hcm 01	O.hcm 02	O.hcm 03	D.hcm 01	D.hcm 02	D.hcm 03
The name of the building	BENH VIEN RANG HAM MAT TRUNG UONG	Kumho Asian Plaza	HaVaNa	Bitexco	LotteMart	Windsor Plaza	DIAMOND PLAZA
Intended use	Hospital	Office	Office	Office	Department stores	Department stores	Department stores

2.1. Procedures of research and analysis (details shown in Fig. 2)

Procedure 1, determining the subject - three types of organizations had selected as the research subjects, namely, hospitals, office buildings, and department stores in Ho Chi Minh City, Vietnam.

Procedure 2, aspect analysis – this included design aspect; cultural and psychological aspect; use aspect; and construction aspect.

Procedure 3, problem definition:

- Regarding the design aspect, problems had divided into two categories: Braille systems and literal meanings.
- Regarding the use aspect, problems had divided into two categories: chip positioning and chip recognition.
- Regarding the construction aspect, problems had examined in the form of instances of mistakes.
- Elevator specifications had examined according to the keyboard layout.

Procedure 4, functional divisions - functions had divided into internal and external functions.

Procedure 5, individual buttons - up, down; open, close; floor; and alarm.

Procedure 6, solutions - countermeasures had provided for problem resolution following analysis.

Procedure 7, conclusion - a Braille symbol look-up table had developed for design referencing.

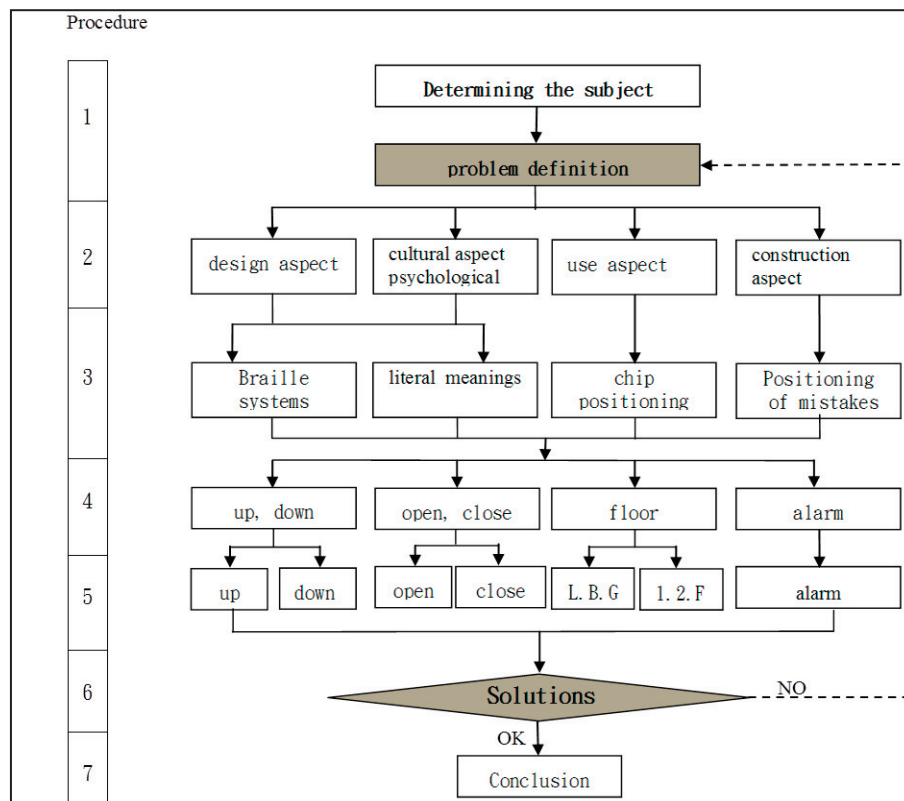






Fig.2. Procedures of research and analysis

2.2. Recognition of basic Braille symbols in elevators, including up and down, open and close, floor indicators, and alarm (Yi-Jen Fang 2011)









This section provides the literal meanings of Braille labelling in elevator facilities, including the up and down section shown in Figure 3 (a), open and close section shown in Figure 3 (b), floor indicators shown in Figure 3 (c), and alarms section shown in Figure 3 (d). The Braille symbols and meanings have primarily provided in the English Braille system. (Yu-Jia Xu 2010)

literal meanings	u p	d o w n
		
Braille symbols	u p	d o w n


(a)

literal meanings	o p e n					c l o s e				
										
Braille symbols	o p e n					c l o s e				

(b)

literal meanings	B	G	M	L	1	2	3	4
								
Braille symbols	B	G	M	L	1	2	3	4

(c)

literal meanings	a l a r m			
				
Braille symbols	a	l	a r	m

(d)

Fig.3. (a) up and down section shown; (b) open and close section shown; (c) floor indicators shown; (d) alarms section shown

3. Case analyses on various aspects

In this study, accessible elevator facilities in hospitals, office buildings, and department stores in Ho Chi Minh City, Vietnam had examined. Various aspects of the data gathered from a survey had processed with statistical procedures for analysis.

Analysis from the design aspect: (tables preceding with letter A): the two codes (A1 and A2) used for elevator Braille panel design and their meanings.

(1). Braille systems (i.e., English Braille, numeric, and Korean letters).

(2). Meanings of words.

A1-1: Analytical comparisons on the landing call buttons of the Braille system

- Problem definition: Statistically analysing the number of cases adopting A1 Braille system in elevators' English Braille systems and other language Braille systems.
- Functional division: A1-1, up and down section: the landing call functions had controlled using the landing call buttons on an external control panel.
- Statistical comparisons: comparing the ratio of table functions using Braille systems, in Table 2 (A1-1.1), 85.7% of the landing call buttons used English Braille symbols, and 14.3% used Korean Braille symbols (in the H.hcm01 building).

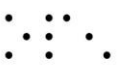







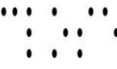







Table 2. A1-1.1 Vietnam investigate cases 【up】、【down】 word table

Code	H.hcm 01	O.hcm 01	O.hcm 02	O.hcm 03	D.hcm 01	D.hcm 02	D.hcm 03	Utilization
 up	 상 sang	 up	 up	 up	 up	 down	 up	English 85.7% Korean 14.3%
 down	 하 ha	 down	 down	 down	 down	 down	 down	English 85.7% Korean 14.3%
Languages	Korean	English	English	English	English	English	English	Korean 14.3%

A1-2: Analytical comparisons on the open and close buttons of the Braille system

- Problem definition: Statistically analyzed the number of cases adopting A1 Braille system in the elevators' English Braille system and other language Braille systems.
- Functional division: A1-2, open and close section: the doors' open and close functions had controlled with the open and close buttons on the internal control panel.
- Statistical comparisons: A comparative analysis on the open and close buttons shown in Table 3 (A1-2.1) indicated that 85.7% of these buttons used English Braille symbols, and 14.3% use Korean Braille symbols (in the H.hcm01 building).

Table 3. A1-2.1 Vietnam investigate cases 【open】、【close】 word table

code	H.hcm 01	O.hcm 01	O.hcm 02	O.hcm 03	D.hcm 01	D.hcm 02	D.hcm 03	Utilization
 open	 개 ke	 open	 open	 open	 open	 open	 open	English 85.7% Korean 14.3%
 close	 폐 pye	 shut	 shut	 shut	 shut	 shut	 shut	English 85.7% Korean 14.4%
languages	Korean	English	English	English	English	English	English	








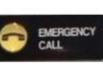
A2-1: Analytical comparisons of the literal meanings of the landing call buttons

- Problem definition: statistical analysis on the variance of word meanings between those in Table A2 and the collected cases.
- Functional division: A2-1, up and down section the landing call functions had controlled with the landing call on the external control panel.

A1-3: Analytical comparisons on the alarm buttons of the Braille system

- Problem definition: statistically analyzed the number of cases adopting A1 Braille system in elevator English Braille system and other language Braille systems. (Taniai Susumu, Kurosaki Etsuko2002).
- Functional division: A1-3, alarm buttons: alarm information controlled using the internal control panel.
- Statistical comparisons: a comparative analysis on the alarm buttons shown in Table 4 (A1-3.1) indicated that 83.3% of the alarm buttons used English Braille symbols and 14.3% used Korean Braille symbols (in the H.hcm01 building).

Table 4. A1-3.1 Vietnam investigate cases 【alarm】 word table

code	H.hcm 01	O.hcm 01	O.hcm 02	O.hcm 03	D.hcm 01	D.hcm 02	D.hcm 03	Utilization
								
a l a r m	경보	a l m	a l m	a l a r m	a l m	a l m	no	English 83.3% Korean 14.3%
languages	Korean	English	English	English	English	English	no	

A2-1: Analytical comparisons of the literal meanings of the landing call buttons

- Problem definition: statistical analysis on the variance of word meanings between those in Table A2 and the collected cases.
- Functional division: A2-1, up and down section: the landing call functions had controlled with the landing call buttons on the external control panel.
- Statistical comparisons: according to a comparative analysis on the up buttons in Table 5 (A2-1.1), 71.4% of the functional buttons contained the word “up,” and 14.3% contained the Korean Braille symbol “상” (sang). The use of 71.4% of the “up” buttons. A comparative analysis on the down buttons in Table A2-1.1 indicated that 85.7% of the functional buttons contained the word “down,” and 14.3% contained the Korean Braille symbol “하” (ha). The use of 85.7% of the “down” buttons.

A2-2: Analytical comparisons of the literal meanings of the open and close buttons

- Problem definition: statistical analysis on the variance of A2 word meanings against the collected cases.
- Functional division: A2-1, open and close section: opening or closing the door by controlling the open and close buttons on the internal control panel.
- Statistical comparisons: A comparative analysis on the open buttons in Table 6 (A2-2.1) indicated that 85.7% of the functional buttons contained the word “open,” and 14.3% contained the Korean Braille symbol “개” (ke). The use of 85.7% of the “open” buttons conformed to Vietnamese Construction Standards TCXDVN264:2002 specifications. A comparative analysis on the close buttons in Table A2-2.1 indicated that 85.7% of the functional buttons contained the word “shut” and 14.3% contained the Korean Braille symbol “폐” (pye).

Table 5. A2-1.1 Vietnam investigate cases 【up】、【down】 word table











Code	H.hcm 01	O.hcm 01	O.hcm 02	O.hcm 03	D.hcm 01	D.hcm 02	D.hcm 03	Utilization	Correct rate
									
u p	상 sang	up	up	up	up	down	u p	u p 71.4%	u p
Literal meanings	Korean up	up	up	up	up	Reverse	up	상 sang 14.3%	71.4%
									
down	하 ha	down	down	down	down	down	down	down 85.7%	down
Literal meanings	Korean down	down	down	down	down	down	down	하 ha 14.3%	85.7%









Table 6. A2-2.1 Vietnam investigate cases 【open】、【close】 word table

Code	H.hcm 01	O.hcm 01	O.hcm 02	O.hcm 03	D.hcm 01	D.hcm 02	D.hcm 03	Utilization	Correct rate
									
o p e n	개 ke	open	open	open	open	open	open	open 85.7%	o p e n
literal meanings	Korean open	open	open	open	open	open	open	개 ke 14.3%	85.7%
									
c l o s e	폐 pye	shut	shut	shut	shut	shut	shut	shut 85.7%	c l o s e
literal meanings	Korean close	shut	shut	shut	shut	shut	shut	폐 pye 14.3%	0%

A2-3: Analytical comparisons of literal meanings on the alarm buttons

- Problem definition: statistical analysis on the variance of A2 word meanings against the collected cases.
- Functional division: A2-3, alarm buttons: controlled by the alarm button on the internal control panel of the elevators.
- Statistical comparisons: a comparative analysis on the alarm buttons in Table 7 (A2-3.1) indicated that 57.1% of the functional buttons contained the word “alm,” 14.3% contained the word “alarm,” and 14.3% contained the Korean Braille symbol “경보”(alarm).

Table 7. A2-3.1 Vietnam investigate cases 【alarm】 word table

Code	H.hcm 01	O.hcm 01	O.hcm 02	O.hcm 03	D.hcm 01	D.hcm 02	D.hcm 03	Utilization	Correct rate
								alarm14.3%	
a l a r m	경보	a l m	a l m	alarm	a l m	a l m	×	경보 14.3% alarm 57.1%	alarm 14.3%
Languages	Korean	alm	alm	alarm	alm	alm	no		

3.1. Analysis on the psychological aspect

When naming spaces or floors, traditional Chinese culture holds certain taboos. For example, number 4 has avoided as a floor number. In the elevator Braille systems surveyed in Ho Chi Minh City, the number 4 had not skipped or deleted, indicating that the fourth floors have used in the elevator buttons of various buildings.

3.2. Analyses on the use aspect

According to Vietnamese Construction Standards TCXDVN 264:2002 5.8.7, accessible elevators should be designed to provide appropriate raised symbols and Braille systems on the left-hand side. People with visual impairment read the symbols through tactile-based sensing by moving their index finger from left to right. Therefore, considering the behavioral pattern of the visually impaired, the symbols representing functional buttons of Braille elevators should be first confirmed in the positioning of Braille symbols, followed by confirming whether these functions have required for the use of the visually impaired.

3.2.1. Analysis from the use aspect: (the table preceding with letter B): referring to the positioning of the elevators' Braille panels and control buttons.

B1-1: Analytical comparisons between the placement of the Braille chips and the landing call buttons






- Problem definition: analyzing the number of cases of elevator Braille chips in relation to the positions of the control buttons.
- Functional division: B1-1, up and down section: the landing call functions had controlled using the landing call buttons on external control panels.
- Statistical comparisons: comparing the ratio of the positional relations between the landing call functional buttons in Table 8 (B1-1.1) and the Braille panels. Among the landing call buttons, 28.6% of Braille symbols had placed on the right side of the control buttons, and 71.4% were on the lower portion of the control buttons, which conformed to Vietnam Construction Standards TCXDVN264:2002 specifications.

B1-2: Analytical comparisons between chip positions and floor buttons

- Problem definition: statistically analyzing the number of cases adopting numeric Braille system and English Braille systems in elevators.
- Functional division: B1-2, floor buttons: landing the elevator on various floors had controlled by the floor buttons on the inside control panel.








- Statistical comparisons: the GROUND floor buttons in Table 9 (B1-2.1) had compared to analyze the ratio of the relationships between the control buttons and Braille chip positions. Among the GROUND floor buttons, 28.6% had placed on the right of the control buttons, and 71.4% were on the lower portion of the control buttons, which conformed to Vietnam Construction Standards TCXDVN264:2002 specifications.

Table 8. B1-1.1 Vietnam investigate cases 【up】、【down】 word table

Code	H.hcm 01	O.hcm 01	O.hcm 02	O.hcm 03	D.hcm 01	D.hcm 02	D.hcm 03	Utilization	Correct rate
lower portion								lower portion 71.4%	71.4%
	○	○	○	○	○	× Right Reverse	× Right	Right 28.60%	
lower portion								lower portion 71.4%	71.4%
	○	○	○	○	○	× Right	× Right	Right 28.6	

○: Regulatory compliance, ×: Non-compliance

Table 9. B1-2.1 Vietnam investigate cases 【The Ground floor】 word table

Code	H.hcm 01	O.hcm 01	O.hcm 02	O.hcm 03	D.hcm 01	D.hcm 02	D.hcm 03	Utilization	Correct rate
lower portion								lower portion 71.4%	71.4%
	○	○	○	○	○	× Right	× Right	Right 28.6%	

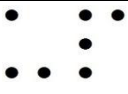







○: Regulatory compliance, ×: Non-compliance

Analysis from a construction aspect: (the table preceding with the letter C): referring to the cases of construction mistakes in the elevators' Braille panels.

C1-1: Analytical comparisons of the construction mistakes between the landing call buttons

- Problem definition: analyzing the number of cases of construction mistakes in the elevators' Braille chips.
- Functional division: C1-1, up buttons: the landing call functions had controlled using the landing call buttons on the external control panels.
- Group comparisons: the ratio of construction mistakes between the up buttons and the Braille chips. Among the UP buttons, 14.3% had assembled upside down by mistake.

Table 10. C1-1.1 【up】 construction error statistical comparison table

Code	H.hcm 01	O.hcm 01	O.hcm 02	O.hcm 03	D.hcm 01	D.hcm 02	D.hcm 03	Construction error rate
								14.3%
	O	O	O	O	O	×Reverse	O	

O: Regulatory compliance , ×: Non-compliance

D: The elevator control panel layouts consisted of three parts:

- FLOOR buttons represented by Code F;
- Open and Close buttons represented by Code O;
- Alarm buttons represented by Code A. In addition, a Hold button can be added, which has represented by Code h. Regarding the samples collected from Ho Chi Minh City, all cases adopted AFO, as shown in Table 11.

4. Problems and countermeasures

Seven public buildings of Ho Chi Minh City, Vietnam, had selected for analyses from various aspects, and the problems and countermeasures are as follows:

4.1. Design aspect

Problems: inconsistent abbreviations of English usage in the Braille system.

- For example, among the close buttons, up to 85.7% used the English word “shut,” which is different from the word “close” recommended by Vietnamese.
- The up and down buttons used the English words “up” and “down,” respectively, conforming to Vietnamese, with only one elevator adopting the Korean Braille system.
- Several English words for the alarm buttons had used, including “alm” and “alarm.” The “alm” did not conform to Vietnamese, but had used in 57.1% of the cases.

Countermeasures:

- Adherence to “close” should be enacted as a standard under Vietnam’s Construction Standard TCXDVN264:2002 specifications by informing elevator manufacturers through public announcement.
- Because Vietnamese do not cover all situations, the Braille symbols for “up” and “down,” as well as the English abbreviations for elevator Braille symbols, have not standardized. Therefore, for the purpose of compliance with International Braille systems, a consistent, standardized universal Braille system should be developed. It has suggested that the standard Braille symbols for up and down functions, both in English and numeric, be added to achieve universality and simplicity, and to avoid confusion with English Braille symbols.

4.2. The use aspect

- Problems: Braille symbols should accommodate the tactile-based reading behaviors of people with visual impairments. Therefore, Braille symbols should be prominently positioned at the bottoms of

control buttons for easy recognition. Currently, ground floors have represented by multiple variations of English Braille symbols, including 1, G, and LL, causing confusion.

- Countermeasures: Accordance with Vietnam, the English words representing floor landing call buttons have not standardized. Users with visual impairments spend time confirming control buttons.

4.3. The construction aspect

































- Problems: Investigations have identified several cases of Braille symbol displacement, particularly in control panels where Braille symbols have placed on the right side.
- Countermeasures: It had discovered that the problem was a mistake caused by reversely placing the control buttons during construction (failing to conform to Vietnamese) after analyzing the construction process. Consequently, it has suggested that an integrated design (with the meaning of the words being made clear) be adopted, making panels more visually appealing and less error-prone.

5. Conclusion and recommendations

In this study, elevators' Braille systems in seven public buildings, in Ho Chi Minh City, (with accessible elevators) had compared and analyzed, and countermeasures had developed.

5.1. Conclusions

- Ratio of systems using English abbreviations: (a). "close" for close: 0%; (b). "open" for open: 85.7%; (c). "alarm" for alarm: 14.3%. This was not a high ratio, and the implementation has not been examined in detail.
- In the elevators of Ho Chi Minh City, Braille chips have primarily located at the lower part of control buttons, favoring the tactile-based reading behaviors of the visually impaired. However, these placements can easily cause accidental touching. Consequently, implementation efficiency has not been further examined.
- For the Braille symbols regarding floor indication, currently, G, L, and 1 represent the ground floor, causing confusion. Conformity to legislation and regulations is questionable.
- The proposed reference table for Taiwanese and Vietnamese Braille systems (Table 11) provides a valuable reference for the Vietnamese government for content integrity.

Nút điều khiển	Ký hiệu quy ước	Ký hiệu theo thứ tự chữ nổi brail	Tỷ lệ
 Cửa mở			
 Cửa mở nhìn từ phía trong			
 Cửa đóng			
 Cửa đóng nhìn từ phía trong			
 Ký hiệu tại lối vào chính			
			
 Điện thoại			
 Đứng lại			

Further, the application of the Braille Universal Design in accessible elevators can be introduced to escalators, providing more convenient access and safety guide for the visually impaired people.

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